DOCUMENT RESUME

ED 028 810 LI 001 482

By-Artandi, Susan; Wolf, Edward H.

The Effectiveness of Weights and Links in Automatic Indexing. Project MEDICO Second Progress Report.

Rutgers, The State Univ., New Brunswick, N.J. Graduate School of Library Service.
Spons Agency-Public Health Service (DHEW), Washington, D.C. National Library of Medicine.
Report No-PHS-LM-94
Pub Date Nov 68
Note-63p.; The first progress report is ED 022 504 and the third progress report is LI 001 483
EDRS Price MF-$0.50 HC-$3.25
Descriptors-*Automation, Computer Programs, Computers, Content Analysis, Evaluation, *Indexing, *Information Retrieval, *Information Storage, Input Output, Operations Research, *Statistical Analysis
Identifiers-MEDICO, *Model Experiment in Drug Indexing by Computer

This report describes work concerned with the statistical evaluation of the output of MEDICO automatic indexing procedure. The statistical tests were designed to examine the validity of the assumptions which formed the bases of the indexing algorithms with primary emphasis on the algorithm development for the computation of weights and links. Some of the findings of the evaluation were: (1) of the weights assigned by the MEDICO and manual check procedures, 98% were either in agreement or differed by a weight of 1, indicating that the effectiveness of the method of weighting could be improved by allowing only two weights in the system instead of the three weights actually used; (2) when the definition of a link was changed from co-occurrence within a sentence to co-occurence between two punctuation marks, the percentage of relevant links increased from 72% to 84%; and (3) a comparison of the index terms generated from full text with those generated from the reduced text of abstracts or summaries showed that the proportion of terms indexed from reduced text is greatest for those terms which had higher weights in the full text analysis. An appendix includes the statistical tests used, the output of the full text and reduced text programs, and a bibliography of the articles used in the statistical test. (Author/JW)

ED028810

LI 001482

THE EFFECTIVENESS OF WEIGHTS AND LINKS IN AUTOMATIC INDEXING

Project MEDICO Second Progress Report

by
Susan Artandi
and
Edward H. Wolf

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

LI 001482

Graduate School of Library Service
Rutgers, the State University
New Brunswick, New Jersey

November 1968

THE EFFECTIVENESS OF WEIGHTS AND LINKS IN AUTOMATIC INDEXING

Project MEDICO Second Progress Report

(LM-94 Grant)

by

Susan Artandi

Graduate School of Library Service
Rutgers, the State University

and

Edward H. Wolf

Statistics Center
Rutgers, the State University

Graduate School of Library Service
Rutgers, the State University
New Brunswick, New Jersey

November 1968

FOREWORD

The research described in this Second Progress Report was conducted under grant LM-94 from the Public Health Service National Library of Medicine.

Rutgers University personnel participating actively in the phase of the work described here are:

Dr. Susan Artandi, Principal Investigator
Associate Professor, Graduate School of Library Service

Dr. Edward H. Wolf
Assistant Professor, Statistics Center

Mrs. Gillian McElroy, MLS 1968

ABSTRACT

Work concerned with the statistical evaluation of the output of the MEDICO automatic indexing method is described. The statistical tests were designed primarily to examine the validity of the assumptions which formed the bases of the algorithms developed for the automatic computation of weights and for the automatic generation of links between index terms and modifiers. Evaluation also included a comparison of the output generated from full text and from the processing of the abstracts or summaries of the same articles.

TABLE OF CONTENTS

		Page
I.	Status of the Project	1
II.	Summary	3
III.	Statistical Evaluation of the Effectiveness of Automatically Generated Weights and Links	5
	Introduction	5
	Weights	8
	Links Between Drug Terms and Modifiers	10
	Summary	10
IV.	Comparison of Output From Full Text with Output Generated from Abstracts or Summaries	15
	Introduction	15
	Weights	15
	Links Between Drug Terms and Modifiers	17
	Summary	18

Appendix

1.	Statistical Tests for Full Text	23
2.	Statistical Tests for Reduced Text	29
3.	Terms for Each Article with Their Respective Weights	33
4.	Output of the MEDICO Program from Full Text for the Test Articles	39
5.	Output of the MEDICO Program from Reduced Text for the Test Articles	55
6.	Bibliography of Articles Included in the Statistical Test	65

I. STATUS OF THE PROJECT

Phase I of the Project concerned with the development of the automatic indexing method was completed and described in the First Progress Report published in January 1968.

This Second Progress Report describes work related to the statistical evaluation of the output of the automatic indexing method which was developed in Phase I.

Preparation of the search program for the automatically generated index file is near completion and will be described in the next report. This third report will also include the results of searches in response to queries.

II. SUMMARY

This is the Second Progress Report on research in the automatic indexing of drug information conducted at Rutgers University under grant LM-94 from the Public Health Service National Library of Medicine.

The report describes work concerned with the statistical evaluation of the output of the automatic indexing method which was developed and implemented in Phase I of the Project.* The method will generate index tags automatically from natural language text and by utilizing explicitly defined text characteristics it creates a machine searchable file of index records for the documents being processed.

The statistical tests were designed to examine the validity of the assumptions which formed the bases of the indexing algorithms with primary emphasis on the algorithms developed for the computation of weights and for the generation of links between index terms and modifiers.

The articles included in the test were scanned by a human indexer to check the correctness of the weights appearing in the output of the automatic indexing program. The links were similarly checked to determine whether they were correct in the context of the sentence.

The statistical evaluation for weights and links gave the following results: A comparison of the weights assigned to terms using the MEDICO and manual procedures gave the same value for 71% of the terms generated by either procedure. A moderate increase in agreement (78%) was observed when only terms having a weight of 3 by at least one of the methods were considered. Ninety-eight percent of the weights assigned by the two methods were found to be either in agreement or to differ by a weight of 1. These findings seem to indicate that the effectiveness of the method of weighting could be improved by allowing only two weights in the system.

Seventy-two percent of the links generated between index terms and modifiers by a full text scan of the articles by the MEDICO procedure were relevant. While writing style does not appear to have an effect on the proportion of agreements on weights for the MEDICO and the manual method, the percentage of relevant links observed was found to be dependent on the author's writing style. The proportion of relevant links decreased as the average length of the sentences increased. When the definition of a link was changed from co-occurrence within a sentence to co-occurrence between two punctuation marks, the percentage of relevant links increased to 84% for the articles studied.

---

*Artandi, Susan and Stanley Baxendale. Project MEDICO. First Progress Report. New Brunswick, N.J., Graduate School of Library Service, Rutgers, the State University, January 1968.

Evaluation also included a comparison of the output generated from full text scanning and from the processing of the abstracts or summaries of the same articles. This comparison was considered important because of the difference in cost involved between full text and reduced text processing. The data resulting from the statistical evaluation should give some indication of the improvement in output that can be expected as a result of the additional expense involved in full text processing.

No significant difference was found in the performance of the two forms of reduced text, abstracts and summaries.

A comparison of the index terms generated from full text with those which were generated from reduced text showed that the proportion of terms indexed from reduced text is greater for those terms which had high weights in the full text analysis. Eighty-six percent of terms having a weight of 3, 46% of the terms having a weight of 2, and 11% of the terms having a weight of 1 in the full text analysis were also generated from reduced text.

III. STATISTICAL EVALUATION OF THE EFFECTIVENESS OF AUTOMATICALLY GENERATED WEIGHTS AND LINKS

Introduction

In his study of index language Cleverdon suggests that indexing systems are made up of a basic vocabulary and a number of devices. These index language devices are of two kinds: 1) recall devices which are intended to increase the probability of retrieving a larger number of relevant documents, and 2) precision devices which are intended to ensure that non-relevant documents are not retrieved.[1] Coordination, weights, roles, and links are precision devices, all of which have the effect of increasing the specificity of index terms or search terms. While these particular devices are frequently associated with post-coordinate systems, they are by no means limited to such systems.[2]

Weighting means the assignment to a term a value representing the relative significance of that term in the total subject description of the document or in the query. Thus, a term which represents a central theme gets a high weighting and one which represents only a marginal element in the subject gets a low weighting. Links indicate particular connection between terms where the lack of such a link might create ambiguity.

Research related to the use of these devices has been largely centered around systems in which the indexing of documents was done by humans. The research described in this paper developed a method for the automatic generation of weights and links as part of an automatic indexing method. In automatic *indexing the computer assigns index terms directly from the natural language text of the document* applying the same algorithm for each document. In human indexing the indexer makes a separate judgment for each document.

The automatic indexing method which was developed in Project MEDICO[3] will generate an index tag automatically from natural language text. The group of documents used in the Project are English language periodical articles published in the medical literature. In their indexing the emphasis was on drug-related information because of the extensive needs which exist in the drug information area.

The computer scans the text of documents and by utilizing explicitly defined text characteristics it creates an index record for each document containing the following elements:

Author

Title

Bibliographic citation

Index terms without modifiers with their respective weights and Chemical Abstracts Registry Numbers

Index terms with modifiers with their respective weights

Figure 1 shows a sample printout of the output of the automatic indexing program.

The file of these index records can be searched on a coordinate basis. The use of the Boolean connectives AND, OR, and NOT, enables the system to answer search questions requiring the presence or absence of several parameters in specific combinations.

To indicate the relative importance of various index tags in the document description, the program automatically assigns a weight to each index term. To indicate the context in which the drug term is used in the document, the indexing program automatically links drug terms with modifying terms.

The algorithm developed for the computation of weights is based on the assumption that the relative frequency of occurrence of terms in the text can serve as an indication of the importance of the subjects they represent. This assumption can be traced back to early experimental work of H. P. Luhn[4] followed by others[5] who developed various indexing methods based on the frequency of terms in the text. In the method which is described here, relative rather than absolute frequency was used in the computation of weights to compensate for differences in length among articles. The computer calculates the number of occurrences per thousand text words and converts the resulting figure into a weight in the following manner: If the frequency of the term per thousand text words is less than or equal to 1, the document is assigned a weight of 1. If the frequency of the term per thousand words is greater than 1 and less than 3, the term is assigned a weight of 2. Finally, if the frequency of the term per thousand words is greater than or equal to 3, a weight of 3 is assigned to it.

The automatic generation of links is based on the assumption that co-occurrence within a sentence is a satisfactory indication that the terms belong together within the context of the document. Because the test documents were medical articles and because emphasis in the indexing was on drug-related information links were created primarily between the names of drugs or chemicals and terms which could act as modifiers. Therapy, activity, effect, administration, are examples of modifiers.

The following are examples of sentences from which valid links between drug names and modifiers were automatically generated.

"In the review of English literature of the past ten years the author has found no other reference to the occurrence of hyperglycemia following the administration of diphenylhydatoin in humans."

"It was therefore estimated that he received a total dosage of at least 800 mg. of diphenylhydantoin in a 24 hour period or approximately 70 to 80 mg. per kilogram."

The first sentence generated the index term diphenylhydatoin/administration and the second generated the term diphenylhydatoin/administration.

The statistical evaluation described in this report was intended to shed light on the validity of the assumptions just discussed. In the case of links it should also show the significance of linear

BUCHANAN DS
AN APPROACH TC MANAGEMENT OF STATUS EPILEPTICUS.
SOUTHWEST MED 47,187-9, JUL 66

NO. OF WORDS = 1760
(2) BARBITURATES

57432 (2) AMOBARBITAL, 5-ETHYL-5-ISOAMYLBARBITURIC ACID, BARBITURATES, AMYTAL

50066 (3) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENOBARBITAL, BARBITURATES

(2) ANTICONVULSANTS

57410 (3) DIPHENYLHYDANTOIN, 5,5-DIPHENYL-2,4-IMIDAZOLIDINEDIONE, HYDANTOINS

AMYTAL/ THERAPY (1)
AMOBARBITAL/ THERAPY (1)
PHENOBARBITAL/ ADMINISTRATION (1), EFFECT (1), THERAPY (2)
ANTICONVULSANTS/ EPILEPSY (1), THERAPY (1)
DIPHENYLHYDANTOIN/ DOSAGE (2)
BARBITURATES/ ACTIVITY (1)

E N D O F A R T I C L E

FIG. 1

distance within a sentence between index terms and modifiers or the role of intervening textwords.

Fifteen articles were selected for the test. The articles were scanned by a human indexer to check the correctness of the weights appearing in the output of the automatic indexing program when human judgment rather than an automatic method is used. The links in the output were checked to determine whether they were correct in the context of the sentence. The manual work was done by a single individual and no attempt was made to determine the variability associated with different individuals checking the same article.

Weights

As was already indicated, the algorithm for the automatic assignment of weights utilizes text characteristics on the basis of purely quantitative criteria. The manual checking of weights involved some subjectivity on the part of the evaluator. A weight of 3 was judged correct for a term which in the opinion of the evaluator is central to the theme of the article, a weight of 2 for a subject of minor importance, and a weight of 1 when the subject was considered incidental to the theme of the article. On the basis of this the number of agreements and disagreements was recorded for each document. The automatic and the manual methods were said to agree when both assigned the same weight to a particular index term.

The results are summarized in Table 1.

Table 1: Agreements and Disagreements for Each Article

Article	Agreements	Disagreements	Total
1	8	1	9
2	3	3	6
3	28	13	41
4	5	2	7
5	12	1	13
6	7	4	11
7	3	1	4
8	14	3	17
9	11	3	14
10	4	2	6
11	22	10	32
12	3	3	6
13	7	7	14
14	5	2	7
15	6	1	7
Totals	138	56	194

A χ^2 test to test the hypothesis that the proportion of agreement between the two methods is unaffected by writing style (the observed difference in the proportion of agreements is due purely to chance) yielded a value of 12.66. The critical χ^2 value with a risk of 0.10 and degrees of freedom 14 is 21.06. Since the observed value is less than the critical value we accept the hypothesis that the differences in the observed proportion of agreements is due to chance.

We now consider the fifteen articles collectively. Classify each term or link on the basis of the weights assigned by the two methods. For example, the MEDICO procedure might have given a particular term a weight of 3, while the manual method classified the term as weight 2. Thus we have the classification (3,2) for the particular term. The total number of such classifications is 15 since each method can yield a weight of 0, 1, 2, or 3. The classification (0,0) is not possible because we are considering only those terms which are assigned by at least one of the two methods compared. Table 2 summarizes the frequencies observed in the form of a two-way table.

Table 2: Comparison of Weights Assigned by the Two Procedures

MEDICO Evaluation \ Manual Evaluation	0	1	2	3	Totals
0		18	0	0	18
1	14	79	8	0	101
2	2	6	31	6	45
3	2	0	0	28	30
Totals	18	103	39	34	194

Table 2 shows that the great majority of disagreements have a difference of 1 in weight. Of the 56 disagreements only 4 had a difference of more than 1. The most serious disagreement was the case where MEDICO gave a weight of 3 to a linked term and the manual evaluation recorded for it a weight of 0. The term in question was erroneous because an incorrect link was involved. Therapy was linked with phenobarbital whereas the article was concerned with the treatment of phenobarbital poisoning.

The total proportion of agreements between the two methods was 0.71 (138/194). A 95% confidence interval for the true proportion of agreements is from 0.65 to 0.77. Ninety-eight percent of the weights assigned by the two methods were found to be either in agreement or to differ by a weight of 1.

A moderate increase in agreement was observed when the classifications having weight 3 by either or both methods were considered. The proportion of agreement in that case was 0.78 (28/36) yielding a 95% confidence interval of 0.64 to 0.92.

Links Between Drug Terms and Modifiers

In the evaluation of the linking procedure again the MEDICO output was compared with manual results. The purpose of the test was to (1) determine the proportion of relevant links, (2) determine whether writing style has an effect on the proportion of relevant links, and (3) consider criteria other than co-occurrence in a sentence in defining a link. Table 3 and 4 summarize the results from the linking evaluation.

The MEDICO procedure recorded a total of 285 links of which 63 were judged irrelevant. The average number of words between the terms which were linked was 3.71 words while the average link distance for the irrelevant links was 7.08 words. This difference in linear distance suggested that perhaps the criterion of co-occurrence within a sentence should be revised. For example, suppose we consider only those links whose distances are less than the grand average 3.71 plus 2 standard deviations. This approach would be valid if (1) the variance of the link distances for each article appear homogeneous and (2) the average of the link distances for each article are homogeneous. Bartlett's test for homogeneity of variance on the link distances gave significant results for both relevant and irrelevant links. This result was not too surprising since we would expect larger variances to be associated with larger average link distances. (As a matter of fact, we expect the variances to be proportional to the average link distances.) If we consider the log of the link distance rather than the link distance itself, the non-homogeneity of variance is removed.

An Analysis of Variance of the log of the distances was then performed which considered the following factors: link types (relevant and irrelevant), authors, and the author by link type interaction. The results revealed a significant author by link type interaction. We thus conclude that it is not feasible to consider a fixed length in order to separate relevant and irrelevant links. The magnitude of the difference between average lengths of relevant and irrelevant links is dependent on authors (writing style).

Summary

Evaluation of the effectiveness of the methods used for the automatic assignment of weights and links showed some interesting results.

A comparison of the weights assigned to terms using the MEDICO and manual procedures gave the same value for 71% of the terms generated by either procedure. A moderate increase in agreement (78%) was observed when only terms having a weight of 3 by at least one of the methods were considered. Ninety-eight percent of the weights assigned by the two methods were found to be either in agreement or to differ by a weight of 1. These findings seem to indicate that the scale of the method of weighting should be revised, allowing perhaps only two weights in the system instead of three. Future research would have to examine the validity of this assumption.

Table 3: Summary of Link Data

Article	# of Links	Relevant Links				Irrelevant Links			
		Average	Variance	Average Logs	Variance Logs	Average	Variance	Average Logs	Variance Logs
1	19	4.83	44.17	.405	.261	3.77	11.03	.467	.084
2	14	4.00	10.67	.514	.075	5.86	29.48	.540	.275
3	57	3.98	16.98	.422	.147	9.42	28.45	.913	.058
4	10	3.70	3.34	.510	.064	-	-	-	-
5	13	4.75	17.11	.529	.142	12.00	-		-
6	6	3.00	8.40	.317	.158	-	-	-	-
7	11	3.00	1.71	.449	.025	13.67	69.33	1.083	.068
8	27	4.92	25.91	.545	.114	5.50	12.50	.690	.091
9	25	3.88	16.20	.431	.126	5.00	-		-
10	5	5.67	5.33	.722	.045	6.00	32.00	.651	.244
11	19	5.50	21.56	.598	.129	25.00	-	-	-
12	39	2.50	28.58	.116	.125	10.12	55.84	.924	.071
13	29	2.67	3.88	.298	.120	4.55	17.07	.501	.150
14	10	2.62	1.12	.395	.021	3.00	0.00	0.00	-
15	6	2.00	6.00	.141	.119	-	-	-	-

Table 4: Summary of Link Data

		Relevant Links			Irrelevant Links		
Article	# of Links	Number of Links	Average number of words to 2nd term	Variance of link distances	Number of Links	Average of link distances	Variance of link distances
1	19	6	4.83	44.17	13	3.77	11.03
2	14	7	4.00	10.67	7	5.86	29.48
3	57	45	3.98	16.98	12	9.42	28.45
4	10	10	3.70	3.34	0	0	-
5	13	12	4.75	17.11	1	12.00	-
6	6	6	3.00	8.40	0	-	-
7	11	8	3.00	1.71	3	13.67	69.33
8	27	25	4.92	25.91	2	5.50	12.50
9	25	24	3.88	16.20	1	5.00	-
10	5	3	5.67	5.33	2	6.00	32.00
11	19	18	5.50	21.56	1	25.00	-
12	34	26	2.50	28.58	8	10.12	55.84
13	29	18	2.67	3.88	11	4.55	17.07
14	10	8	2.62	1.12	2	3.00	0.00
15	6	6	2.00	6.00	0	-	-
Totals	285	222	3.71		63	7.08	

Seventy-two percent of the links generated by a full text scan of the articles by the MEDICO procedure were relevant. While writing style does not appear to have an effect on the proportion of agreements on weights for the two methods the percentage of relevant links observed was found to be dependent on the author's writing style. The proportion of relevant links decreased as the average length of the sentences increased. This seems to suggest that it may be desirable to change the definition of a link from co-occurrence within a sentence to co-occurrence within two punctuation marks. A preliminary check of the 15 articles studied showed that the number of relevant links would increase to 84% as a result of such a re-definition. Further research is needed to study this assumption in detail.

IV. COMPARISON OF OUTPUT FROM FULL TEXT WITH OUTPUT GENERATED FROM ABSTRACTS OR SUMMARIES

Introduction

Evaluation also included a comparison between the output generated from full text with output from abstracts or summaries of the same articles.

This type of comparison is important because there is good reason to believe that the difference in cost between the two methods is considerable. Data relating to the relative effectiveness of the two methods should give some indication of the degree of improvement that can be expected for the additional expense involved in full text processing.

The purpose of this investigation was to evaluate the following questions:

(1) Does an abstract provide a better index than a summary paragraph?

(2) Do the terms which have a weight of 3 in the full text index appear more frequently in the reduced text index than terms which have a weight of 2 or a weight of 1?

(3) Can we consider the link distance or some function of the average link distance in order to segregate relevant and irrelevant links?

Weights

The average number of words in the reduced text was 127. This relatively small size makes it impossible to rank the importance of terms indexed by assigning weights. We must assume that any term mentioned in the reduced text is important. Under an ideal situation we would expect only terms having weight 3 in the full text index to appear in the reduced text index. The more realistic case, however, is to expect terms having weight 3 in the full text to have a greater frequency of appearance in the reduced index than weight 2 terms which should be more frequent than weight 1 terms. Table 5 gives the number of terms with their previously assigned weights and indicates whether they were included or omitted in the indexing of the reduced text.

To test the hypothesis that an abstract or summary paragraph provides the same amount of information, we considered the frequency of terms indexed and not indexed for the two forms of reduced text with the three weights considered separately. For the weight of 3 terms, the observed χ^2 value was 0.122; weight 2 terms had an observed χ^2 of 0.96 while the weight 1 terms gave a value of 0.094. The three χ^2 values are not significant at any reasonable level, therefore we accept the hypothesis that the two forms give the same amount of information.

We now combine the information from the two forms of reduced text to test the hypothesis that

Table 5: Number of Terms in Full Text

Form of Reduced Text	Article	Indexed Weight 3	Indexed Weight 2	Indexed Weight 1	Not indexed Weight 3	Not indexed Weight 2	Not indexed Weight 1
Abstract	4	2	0	0	0	1	4
Abstract	5	1	1	0	1	4	7
Abstract	7	1	0	1	0	1	1
Abstract	8	4	2	0	0	1	9
Abstract	10	0	0	0	0	1	5
Abstract	11	5	10	3	1	2	11
Abstract	12	2	0	0	0	1	2
Abstract	13	2	2	0	0	1	8
Abstract	14	1	0	1	0	1	4
Summary Paragraph	2	3	0	0	1	0	2
Summary Paragraph	3	4	2	2	0	4	26
Summary Paragraph	6	2	1	0	0	7	0
Summary Paragraph	9	2	2	2	1	0	5
Summary Paragraph	15	0	2	1	0	1	3
Summary Paragraph	1	1	0	1	1	1	5
Abstract		18	15	5	2	13	51
Summary Paragraph		12	7	6	3	13	41
Total		30	22	11	5	26	92

the frequency of terms indexed using a reduced text is independent of the assigned weights from a full text analysis. The observed χ^2 value is 69.84 which is significant at the 0.01 level. We thus conclude that the probability of a term being indexed in a reduced text is dependent on the previously assigned weight using the full text analysis. Terms with high weights have a greater probability of being indexed than those with low weights.

Now we consider only terms generated from reduced text. Of the total of 63 terms assigned, 30 had a weight of 3, 22 a weight of 2, and 11 a weight of 1 in the full text analysis. A χ^2 test to test the hypothesis that each weight has the same expected frequency (N/3) in the reduced index gave a value of 8.67. The critical value for χ^2 at a level of 0.02 is 7.82. We thus conclude that the expected frequency is greater for terms which were assigned higher weights on the basis of full text scanning.

All calculations for the above statistical tests are listed in the appendix.

Links Between Drug Terms and Modifiers

The statistical tests relating to the links which were generated from reduced text were designed to answer the question whether the distance between links or some function of the average distance between links can be considered in order to segregate relevant and irrelevant links.

It was found that the average of the relevant link distances was 3.4 while the average irrelevant link distance was 8.9 words. Table 6 shows that 4 of the irrelevant link distances were quite large when

Table 6: Summary of the Link Data

	Relevant Links			Irrelevant Links	
Article	Number of Links	Number of Links	Length of Links	Number of Links	Length of Links
1	1	1	5	0	-
2	2	1	2	1	1
3	4	2	4,1	2	11,18
4	1	1	5	0	-
5	1	1	8	0	-
6	1	1	1	0	-
7	1	1	2	0	-
8	3	3	4,4,5	0	-
9	3	2	5,1	1	5
10	0	0	-	0	-
11	3	3	7,2,5	0	-
12	1	1	1	0	-
13	4	2	4,1	2	11,14
14	1	0	-	1	2
15	1	1	1	0	-
Totals	27	20	68	7	62

compared to the lengths of the relevant links (11, 18, 11, 14). This would indicate that a significant reduction in the frequency of irrelevant links might occur by defining a link as the co-occurrence within a predetermined distance. For example, suppose we consider only links of 10 words or less in distance. This criterion would yield 23 links of which 20 are relevant. The upper limit of 10 was obtained by considering the average of the relevant link distances (3.4) plus 3 standard deviations of the relevant link distances (2.16).

It should be pointed out that this observation about link distance is based on a small sample size (27). Previous data from the full text analysis indicate that the average of the relevant link distances is dependent on the author's writing style. However, it might happen that all authors write in a more concise form in a summary paragraph or an abstract. Future investigations with larger sample sizes should shed more light on this observation.

Summary

Since no significant difference was found in the two forms of reduced text, abstracts and summaries, they were considered together in the evaluation.

A comparison of the index terms generated from full text with those which were generated from reduced text showed that the proportion of terms indexed from reduced text is greater for those terms which had high weights in the full text analysis. Eighty-six percent of terms having a weight of 3, 46% of the terms having a weight of 2, and 11% of the terms having a weight of 1 in the full text analysis were also generated from reduced text.

REFERENCES

1. Cleverdon, Cyril W. The Cranfield Tests on Index Language Devices. Aslib Proceedings 19:173-194, June 1967.

2. Artandi, Susan. An introduction to computers in information science. Metuchen, N.J., Scarecrow Press, 1968. p. 34.

3. Artandi, Susan and Stanley Baxendale. Project MEDICO. First Progress Report. New Brunswick, N.J., Graduate School of Library Service, Rutgers, the State University, 1968.

4. Luhn, H. P. Potentialities of auto-encoding of scientific literature. Res. rept. RC-101, Yorktown Heights, N.Y., IBM Corp., 1959.

5. Stevens, Mary Elizabeth. Automatic indexing: a state-of-the-art report. National Bureau of Standards Monograph 91. Washington, D.C., National Bureau of Standards, 1965.

APPENDIX

1. Statistical Tests for Full Text

I. Weights

A. χ^2 test for independence of proportion of agreement on author

Article	Agreement		Disagreement	
	Observed	Theoretical	Observed	Theoretical
1	8	6.40	1	2.60
2	3	4.27	3	1.73
3	28	29.15	13	11.85
4	5	4.98	2	2.02
5	12	9.24	1	3.76
6	7	7.82	4	3.18
7	3	2.84	1	1.16
8	14	12.09	3	4.91
9	11	9.95	3	4.05
10	4	4.27	2	1.73
11	22	22.75	10	9.25
12	3	4.27	3	1.73
13	7	9.95	7	4.05
14	5	4.98	2	2.02
15	6	4.98	1	2.02
Totals	138	138	56	56

$$X^2 = \sum_{i=1}^{15} \sum_{j=1}^{2} \left\{ \frac{(O_{ij} - Th_{ij})^2}{Th_{ij}} \right\} = 12.66$$

$$\chi^2_{\alpha=0.10} \quad (df=14) = 21.06$$

Conclusion:

Accept hypothesis of independence since

$$X^2 < \chi^2_{\alpha=.10}$$

B. 95% confidence interval for proportion of agreements (all weights)

$$\hat{p} = 138/.94 = .71$$

$$\sigma_p = \sqrt{\frac{.71(.29)}{.94}} = .032$$

$$.71 - 1.96(.032) \leq p \leq .71 + 1.96(.032)$$

$$.65 \leq p \leq .77$$

C. 95% confidence interval for proportion of agreements having weight 3 by at least one method

$$\hat{p} = 28/36 = .78$$

$$\sigma_p = \sqrt{\frac{.78(.22)}{36}} = .069$$

$$.78 - 1.96(.069) \leq p \leq .78 + .14$$

$$.64 \leq p \leq .92$$

II. Links

A. Testing for Homogeneity of Variance

1. Original Data

Article	Variance of Link Distances: Relevant Links	Irrelevant Links
1	44.17	11.03
2	10.67	29.48
3	16.98	28.45
4	3.34	--
5	17.11	--
6	8.40	--
7	1.71	69.33
8	25.91	12.50
9	16.20	--
10	5.33	32.00
11	21.56	--
12	28.58	55.84
13	3.88	17.07
14	1.12	0.00
15	6.00	--

Bartlett's statistic: $$B = \frac{2.3026}{C} \left\{ \left[\Sigma(n_i - 1)\ln \overline{s^2} - \Sigma(n_i - 1)\ln s_i^2 \right\} \right.$$

where

$$C = 1 + \frac{1}{3(k-1)} \left[\Sigma \frac{1}{n_i - 1} - \frac{1}{\Sigma(n_i - 1)} \right]$$

$$B = 102.8$$

Conclusion:

Reject hypothesis of homogeneity of variance since

$$B > \chi^2_{\alpha=.001} \quad (df=23) = 52.6$$

2. Transformed Data (Log of the link distance)

Article	Variance of Link Distances: Relevant Links	Irrelevant Links
1	.2613	.4673
2	.0752	1.2356
3	.1467	.6607
4	.0642	----
5	.1421	----
6	.1582	----
7	.0253	1.1659
8	.1137	.5456
9	.1261	----
10	.0451	1.3765
11	.1293	----
12	.1249	1.0357
13	.1203	.7222
14	.0214	.0000
15	.1190	----

Bartlett's statistic:

$$B = 25.9$$

Conclusion:

Accept hypothesis of homogeneity of variance since

$$B < \chi^2_{\alpha=0.10} = 34.38$$

3. Analysis of variance of log of link distances

Source	D.f.	S.S.	M.S.	F
Interaction of articles and link types	11	.3238	.2944	2.42
	258	.3141	.1218	

Conclusion:

Reject hypothesis of no interaction since

$$F > F_{.99}(11,258) = 2.3$$

and conclude that average link distance is dependent on article selected.

2. Statistical Tests for Reduced Text

I. Tests the hypothesis that MEDICO index is independent of the form of the reduced text.

A. Weight three terms

	Indexed	Not Indexed	
Abstract	18	2	20
Summary	12	3	15
Totals	30	5	35

$$X^2 = N\left\{ |n_{11}n_{22} - n_{12}n_{21}| - N/2 \right\}^2 / (n_{11}+n_{21})(n_{12}+n_{22})(n_{11}+n_{12})(n_{21}+n_{22}) = 0.122$$

$\chi^2_{\alpha=.05}$ (df=1) = 3.841

B. Weight two terms

	Indexed	Not Indexed	
Abstract	15	13	28
Summary	7	13	20
Totals	22	26	48

$X^2 = 0.96$

C. Weight one terms

	Indexed	Not Indexed	
Abstract	5	51	56
Summary	6	41	47
Totals	11	92	103

$X^2 = 0.094$

Conclusion: Accept hypothesis that frequency of indexing is independent of form of reduced text since the three observed values are all less than χ^2 critical value of 3.841 (df = .05).

II. Testing the hypothesis that indexing is independent of previously assigned weight from full text analysis.

	Indexed		Not Indexed	
	Observed	Expected	Observed	Expected
Weight 3	30	11.85	5	23.15
Weight 2	22	16.26	26	31.74
Weight 1	11	34.89	92	68.11
Totals	63	63	123	123

$$X^2 = \sum_{i=1}^{3} \sum_{j=1}^{2} \left({(O_{ij} - E_{ij})^2}/{E_{ij}} \right) = 69.84$$

$$\chi^2_{\alpha=.005} (df=2) = 10.597$$

Conclusion: Reject hypothesis that indexing in reduced text is independent of previously assigned weight using full text

III. Testing the hypothesis that the proportion of indexed terms of reduced text is the same for all weights.

	Observed	Expected
Weight 3	30	21
Weight 2	22	21
Weight 1	11	21
Totals	63	63

$$X^2 = \sum_{i=1}^{3} \left[{(O_i - E_i)^2}/{E_i} \right] = 8.67$$

$$\chi^2_{\alpha=0.02} (df=2) = 7.82 \qquad \chi^2_{\alpha=0.01} (df=1) = 9.21$$

Conclusion: Reject hypothesis that proportion of indexed terms is the same for all weights (level of significance = 0.02).

IV. Links

Average of relevant links = 68/20 = 3.40 words

Average of irrelevant links = 62/7 = 8.86 words

Standard deviation of relevant links = $s_R = \sqrt{ {\sum_{i=1}^{27} (x_i - \bar{x})^2}/{26} } = 2.16$

Upper limit for links = 3.40 + 3(2.16) = 9.9 words

3. Terms for Each Article with Their Respective Weights

Article 1

Terms	MEDICO	Manual
Diphenylhydantoin	2	2
Barbiturates	3	3
Amobarbital	1	1
5-ethyl-5-phenylbarbituric acid	1	1
Diphenylhydantoin/Therapy	1	1
Barbiturate/Effect	1	1
/Activity	1	1
/Therapy	3	0
/Dosage	1	1

Article 2

Terms	MEDICO	Manual
Barbiturates	3	3
5-ethyl-5-phenylbarbituric acid	3	3
Phenobarbital/Therapy	3	0
/Dosage	2	3
Barbiturates/Administration	1	1
/Therapy	1	0

Article 3

Terms	MEDICO	Manual
Anticonvulsants	3	3
Barbiturates	3	3
5-ethyl-5-phenylbarbituric acid	2	2
Mephobarbital	1	1
Primidone	2	2
Hydantoins	1	1
Diphenylhydantoin	3	3
Trimethadione	2	3
Phensuximide	1	1
Celontin	1	1
Ethosuximide	1	1
Phenacemide	1	1
Mephenytoin	1	1
Anticonvulsants/Epilepsy	1	1
/Activity	3	3
/Effect	1	0
/Properties	1	1
/Therapy	1	1
Barbiturates/Epilepsy	1	1
/Activity	2	1
/Effect	1	1
Hydantoins/Epilepsy	1	1
Dephenylhydantoin/Activity	2	2
/Therapy	1	1
/Effect	1	1
/Epilepsy	1	1
Trimethadione/Administration	1	0
/Activity	2	1
/Dosage	1	0
Primidone/Epilepsy	1	1
/Therapy	1	1
Phenobarbital/Activity	1	0
/Epilepsy	1	1
/Dosage	1	1
Mephobarbital/Therapy	1	1
Metharbital	0	1
Trimethadione/Effect	0	1

Article 3 (continued)

Term	MEDICO	Manual
Phensuximide/Therapy	0	1
Trimethadione/Therapy	0	1
Primidone/Activity	0	1
Anticonvulsants/Adverse reactions	0	1

Article 4

Term	MEDICO	Manual
5-ethyl-5 phenylbarbituric acid	2	2
Anticonvulsants	1	1
Diphenylhydantoin/Administration	2	3
/Effect	1	1
/Dosage	1	2
Anticonvulsants/Administration	1	1
Diphenylhydantoin	3	3

Article 5

Term	MEDICO	Manual
Amobarbital	2	2
5-ethyl-5 phenylbarbituric acid	3	3
Anticonvulsants	2	2
Diphenylhydantoin	3	3
Amytal/Therapy	1	1
Amobarbital/Therapy	1	1
Phenobarbital/Administration	1	1
/Effect	1	1
/Therapy	2	1
Anticonvulsants/Epilepsy	1	1
/Therapy	1	1
Diphenylhydantoin/Dosage	2	2
Barbiturates/Activity	1	1

Article 6

Term	MEDICO	Manual
5-ethyl-5-phenylbarbituric acid	2	2
Diphenylhydantoin sodium	2	2
Anticonvulsants	2	2
Barbiturates	2	2
Diphenylhydantoin	2	3
Dilantin sodium/Therapy	2	2
Anticonvulsants/Epilepsy	2	2
Barbiturates/Epilepsy	2	2
Dilantin/Effect	2	0
/Therapy	2	3
Dilantin/Adverse reactions	0	1

Article 7

Term	MEDICO	Manual
Antispasmodic	3	3
/Effect	2	2
/Administration	1	1
/Activity	1	0

Article 8

Term	MEDICO	Manual
Anticonvulsants	3	3
5-ethyl-5 phenylbarbituric acid	3	3
Dimethadione	3	3
Diphenylhydantoin	3	3
Trimethadione	1	1
Anticonvulsants/Effect	1	2
/Activity	1	1
Phenobarbitone/Effect	2	2
/Therapy	1	1
/Administration	1	1
/Activity	1	1
Diphenylhydantoin/Activity	1	1
/Effect	2	2
Dimethadione/Activity	1	1
Trimethadione/Therapy	1	1
Dimethadione/Therapy	0	1
Anticonvulsants/Dosage	0	1

Article 9

Term	MEDICO	Manual
Diphenylhydantoin sodium	3	3
Anticonvulsants	2	2
Carbamazepine	3	3
Diphenylhydantoin sodium/Effect	3	3
/Therapy	2	2
/Administration	1	1
/Properties	1	1
/Activity	1	1
Anticonvulsants/Effect	1	1
/Activity	1	1
Anticonvulsants/Effect	1	1
/Properties	1	1
Contamazepine/Therapy	1	0
/Effect	1	1
Dilatin	0	1
Hydantoins	0	1

Article 10

Term	MEDICO	Manual
Barbiturates	2	2
Antispasmodic	1	1
Barbiturates/Therapy	1	0
/Activity	1	1
/Effect	1	1
/Dosage	1	0

Article 11

Term	MEDICO	Manual
Anticonvulsants	3	3
5-ethyl-5-phenylbarbituric acid	3	3
5-methyl-5 phenylbarbituric acid	1	2
Primidone	3	3
Diphenylhydantoin sodium	2	3
Diphenylhydantoin	3	3
Mephenytoin	2	2
Trimethadione	3	3
Ethosuximide	1	2
Phensuximide	1	2

Article 11 (continued)

Term	MEDICO	Manual
Celontin	1	2
N-benzyl-Beta-chloropropanamide	2	2
Tetrahydro-2-p-sulfamoyl-phenyl-1,2-thiazine-1,1-dioxide	1	2
(2-phenylbutyryl) urea	2	2
Phenacemide	1	1
Carbamazepine	1	2
Anticonvulsants/Therapy	1	1
/Dosage	1	1
/Effect	2	2
/Properties	1	1
Phenylmethylbarbituric acid/Dosage	1	1
Barbiturates/Dosage	2	2
Phenobarbitone/Dosage	2	1
/Effect	1	1
Primidone/Effect	1	1
/Dosage	1	1
Phenytoin/Dosage	1	1
/Therapy	1	1
Troxidone/Effect	1	1
Beclamide/Effect	1	1
Priminal	0	1
Hydantal	0	1

Article 12

Term	MEDICO	Manual
Anticonvulsants	3	3
/Activity	3	3
/Effect	2	0
/Administration	1	1
/Therapy	1	0
/Dosage	0	1

Article 13

Term	MEDICO	Manual
Trimethadione	3	3
5-ethyl-5 phenylbarbituric acid	1	1
Anticonvulsants/Properties	1	1
/Activity	2	2
/Effect	2	1
/Epilepsy	1	0
Trimethadione/Administration	2	1
/Dosage	1	1
/Activity	1	1
Phenobarbital/Activity	1	0
Anticonvulsants	3	3
Diphenylhydantoin	0	1
" /Activity	0	1
Trimethadione/Effect	0	1

Article 14

Term	MEDICO	Manual
Trimethadione	3	3
/Administration	1	1
/Effect	1	0
/Activity	1	0

Article 14 (continued)

Term	MEDICO	Manual
Trimethadione/Dosage	2	2
/Epilepsy	1	1
/Therapy	1	1

Article 15

Term	MEDICO	Manual
Mephobarbital	1	1
Diphenylhydantoin	2	2
Anticonvulsants	2	2
5-ethyl-5 phenylbarbituric acid	1	1
Anticonvulsants/Therapy	2	2
Phenobarbital/Therapy	1	1
Mebroin	0	1

4. Output From Full Text

BERNSTEIN ZL
TREATMENT OF BARBITURATE COMA.
NEW YORK J MED 66, 2290-4, 1 SEP 66

NO. OF WORDS = 2428
57410 (2) DIPHENYLHYDANTOIN, 5,5-DIPHENYL-2,4-IMIDAZOLIDINEDIONE, HYDANTOINS

(3) BARBITURATES

57432 (1) AMOBARBITAL, 5-ETHYL-5-ISOAMYLBARBITURIC ACID, BARBITURATES

50066 (1) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENOBARBITAL, BARBITURATES

DIPHENYLHYDANTOIN/ THERAPY (1)
BARBITURATES/ EFFECT (1), ACTIVITY (1), THERAPY (3), DOSAGE (1)

E N D O F A R T I C L E

NEALON TF JR, SUGERMAN H, SHEA W
AN EXTRACORPOREAL DEVICE TO TREAT BARBITURATE POISONING. USE OF ANION- EXCHANGE RESINS IN DOGS.
JAMA 197, 158-160, 11 JUL 66

NO. OF WORDS = 1639
(3) BARBITURATES

50066 (3) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENOBARBITAL, BARBITURATES

PHENOBARBITAL/ THERAPY (3), DOSAGE (2)
BARBITURATES/ ADMINISTRATION (1), THERAPY (1)

E N D O F A R T I C L E

LIPP JA
EPILEPSY. II. BASIC NEUROPHYSIOLOGICAL ASPECTS OF ANTICONVULSANT DRUGS.
APPL THER 8, 437-41, MAY 66

NO. OF WORDS = 3001
(3) ANTICONVULSANTS

(3) BARBITURATES

50066 (2) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENOBARBITAL, BARBITURATES

115388 (1) MEPHOBARBITAL, 5-ETHYL-1-METHYL-5-PHENYLBARBITURIC ACID, BARBITURATES

125337 (2) PRIMIDONE, 5-PHENYL-5-ETHYLHEXAHYDROPYRIMIDINE-4,6-DIONE, BARBITURATES

(1) HYDANTOINS

57410 (3) DIPHENYLHYDANTOIN, 5,5-DIPHENYL-2,4-IMIDAZOLIDINEDIONE, HYDANTOINS

127480 (2) TRIMETHADIONE, 3,5,5-TRIMETHYL-2,4-OXAZOLIDINEDIONE, OXAZOLIDINEDIONES

86340 (1) PHENSUXIMIDE, N-METHYL-2-PHENYLSUCCINIMIDE, SUCCINIMIDES

77418 (1) CELONTIN, N,2-DIMETHYL-2-PHENYLSUCCINIMIDE, SUCCINIMIDES, METHSUXIMIDE

77678 (1) ETHOSUXIMIDE, 2-ETHYL,2-METHYLSUCCINIMIDE, SUCCINIMIDES

63989 (1) PHENACEMIDE, PHENYLACETYLUREA

50124 (1) MEPHENYTOIN, 5-ETHYL-3-METHYL-5-PHENYLHYDANTOIN, HYDANTOINS

ANTICONVULSANTS/ EPILEPSY (1), ACTIVITY (3), EFFECT (1), PROPERTIES (1), THERAPY (1)
BARBITURATES/ EPILEPSY (1), ACTIVITY (2), EFFECT (1)
HYDANTOINS/ EPILEPSY (1)
DIPHENYLHYDANTOIN/ ACTIVITY (2), THERAPY (1), EFFECT (1), EPILEPSY (1)
TRIMETHADIONE/ ADMINISTRATION (1), ACTIVITY (2), DOSAGE (1)
PRIMIDONE/ EPILEPSY (1), THERAPY (1)
PHENOBARBITAL/ ACTIVITY (1), EPILEPSY (1), DOSAGE (1)
MEPHOBARBITAL/ THERAPY (1)

E N D O F A R T I C L E

KLEIN JP
DIPHENYLHYDANTOIN INTOXICATION ASSOCIATED WITH HYPERGLYCEMIA.
J PEDIAT 69,463-5, SEP 66

NO. OF WORDS = 1219
57410 (3) DIPHENYLHYDANTOIN, 5,5-DIPHENYL-2,4-IMIDAZOLIDINEDIONE, HYDANTOINS

50066 (2) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENOBARBITAL, BARBITURATES

(1) ANTICONVULSANTS

DIPHENYLHYDANTOIN/ ADMINISTRATION (2), EFFECT (1), DOSAGE (1)
ANTICONVULSANTS/ ADMINISTRATION (1)

E N D O F A R T I C L E

BUCHANAN DS
AN APPROACH TO MANAGEMENT OF STATUS EPILEPTICUS.
SOUTHWEST MED 47,187-9, JUL 66

NO. OF WORDS = 1760
(2) BARBITURATES

57432 (2) AMOBARBITAL, 5-ETHYL-5-ISOAMYLBARBITURIC ACID, BARBITURATES, AMYTAL

50066 (3) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENCBARBITAL, BARBITURATES

(2) ANTICONVULSANTS

57410 (3) DIPHENYLHYDANTOIN, 5,5-DIPHENYL-2,4-IMIDAZOLIDINEDIONE, HYDANTOINS

AMYTAL/ THERAPY (1)
AMOBARBITAL/ THERAPY (1)
PHENOBARBITAL/ ADMINISTRATION (1), EFFECT (1), THERAPY (2)
ANTICONVULSANTS/ EPILEPSY (1), THERAPY (1)
DIPHENYLHYDANTOIN/ DOSAGE (2)
BARBITURATES/ ACTIVITY (1)

END OF ARTICLE

FIG. 1

ARMBRECHT EC, STEERE DW
A CASE REPORT OF EVALUATICN AND MANAGEMENT OF HYPERPLASTIC GINGIVA IN EPILEPTICS CAUSED BY SODIUM DILANTIN THERAPY.
W VIRGINIA DENT J 40,43-4, JUL 66

NO. OF WORDS = 906
50066 (2) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENOBARBITAL, BARBITURATES

630933 (2) DIPHENYLHYDANTOIN SODIUM, SODIUM 5,5-DIPHENYL HYDANTOINATE, HYDANTOINS, DILANTIN SODIUM

(2) ANTICONVULSANTS

(2) BARBITURATES

57410 (2) DIPHENYLHYDANTOIN, 5,5-DIPHENYL-2,4-IMIDAZOLIDINEDIONE, HYDANTOINS, DILANTIN

DILANTIN SODIUM/ THERAPY (2)
ANTICONVULSANTS/ EPILEPSY (2)
BARBITURATES/ EPILEPSY (2)
DILANTIN/ EFFECT (2), THERAPY (2)

END OF ARTICLE

46

DOUGLAS A, SIMPSON D, MERCHANT S
THE EFFECT OF ANTISPASMODIC DRUGS ON THE ENDOMURAL BRONCHIAL (OR SQUEEZE) PRESSURES IN BRONCHITIS AND ASTHMA.
AMER REV RESP DIS 93,703-15, MAY 66

NO. OF WORDS = 4425
(3) ANTISPASMODIC

ANTISPASMODIC/ EFFECT (2), ADMINISTRATION (1), ACTIVITY (1)

E N D O F A R T I C L E

GILBERT JC, ORTIZ WR, MILLICHAP JG
THE EFFECTS OF ANTICONVULSANT DRUGS ON THE PERMEABILITY OF BRAIN CELLS TO D-XYLOSE.
J NEUROCHEM 13,247-55, APR 66

NO. OF WORDS = 3338
(3) ANTICONVULSANTS

50066 (3) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENOBARBITAL, BARBITURATES

695534 (3) DIMETHADIONE, 5,5-DIMETHYLOXAZOLIDINE-2,4-DIONE, OXAZOLIDINEDIONES

57410 (3) DIPHENYLHYDANTOIN, 5,5-DIPHENYL-2,4-IMIDAZOLIDINEDIONE, HYDANTOINS

127480 (1) TRIMETHADIONE, 3,5,5-TRIMETHYL-2,4-OXAZOLIDINEDIONE, OXAZOLIDINEDIONES

ANTICONVULSANTS/ EFFECT (1), ACTIVITY (1)
PHENOBARBITONE/ EFFECT (2), THERAPY (1), ADMINISTRATION (1), ACTIVITY (1)
DIPHENYLHYDANTOIN/ ACTIVITY (1), EFFECT (2)
DIMETHADIONE/ ACTIVITY (1)
TRIMETHADIONE/ THERAPY (1)

E N D O F A R T I C L E

48

CHINITZ A, SEELINGER DF, GREENHOUSE AH
ANTICONVULSANT THERAPY IN TRIGEMINAL NEURALGIA.
AMER J MED SCI 252,62-7, JUL 66

NO. OF WORDS = 2427
630933 (3) DIPHENYLHYDANTOIN SODIUM, SODIUM 5,5-DIPHENYL HYDANTOINATE, HYDANTOINS

(2) ANTICONVULSANTS

298464 (3) CARBAMAZEPINE, TEGRETOL

DIPHENYLHYDANTOIN SODIUM/ EFFECT (3), THERAPY (2), ADMINISTRATION (1), PROPERTIES (1), ACTIVITY (1)
ANTICONVULSANTS/ EFFECT (1), PROPERTIES (1)
CARBAMAZEPINE/ THERAPY (1), EFFECT (1)

E N D O F A R T I C L E

COLLINS VJ
ADVANCES IN PHARMACOLOGY RELATED TO ANESTHESIA AND SURGERY.
INDUSTR MED SURG 35,465-71, JLN 66

NO. OF WORDS = 4594
(2) BARBITURATES

(1) ANTISPASMCDIC

BARBITURATES/ THERAPY (1), ACTIVITY (1), EFFECT (1), DOSAGE (1)

E N D O F A R T I C L E

COOPER P
DRUGS FOR CONVULSIVE DISORDERS.
MIDWIFE HEALTH VISIT 2,212-3, MAY 66

NO. OF WORDS = 1340
(3) ANTICONVULSANTS

50066 (3) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENOBARBITAL, BARBITURATES

76948 (1) 5-METHYL-5-PHENYLBARBITURIC ACID, BARBITURATES

125337 (3) PRIMIDONE, 5-PHENYL-5-ETHYLHEXAHYDROPYRIMICINE-4,6-DIONE, BARBITURATES

630933 (2) DIPHENYLHYDANTOIN SODIUM, SODIUM 5,5-DIPHENYL HYDANTOINATE, HYDANTOINS, GAROIN

57410 (3) DIPHENYLHYDANTOIN, 5,5-DIPHENYL-2,4-IMIDAZOLIDINEDIONE, HYDANTOINS

50124 (2) MEPHENYTOIN, 5-ETHYL-3-METHYL-5-PHENYLHYDANTOIN, HYDANTOINS, METHOIN, MESONTOIN

127480 (3) TRIMETHADIONE, 3,5,5-TRIMETHYL-2,4-OXAZOLIDINEDIONE, OXAZOLIDINEDIONES, TROXIDONE, TRIDIONE

77678 (1) ETHOSUXIMIDE, 2-ETHYL,2-METHYLSUCCINIMIDE, SUCCINIMIDES

86340 (1) PHENSUXIMIDE, N-METHYL-2-PHENYLSUCCINIMIDE, SUCCINIMIDES

77418 (1) CELONTIN, N,2-DIMETHYL-2-PHENYLSUCCINIMIDE, SUCCINIMIDES, METHSUXIMIDE

501688 (2) N-BENZYL-BETA-CHLOROPROPIONAMIDE, CHLOROETHYLPHENAMIDE, BECLAMIDE

61563 (1) TETRAHYDRO-2-P-SULFAMOYL-PHENYL-1,2-THIAZINE-1,1-DIOXIDE, SULTHIAME

90493 (2) (2-PHENYLBUTYRYL)UREA, PHENETURIDE

63989 (1) PHENACEMIDE, PHENYLACETYLUREA

298464 (1) CARBAMAZEPINE, TEGRETOL

ANTICONVULSANTS/ THERAPY (1), DOSAGE (1), EFFECT (2), PROPERTIES (1)
PHENYLMETHYLBARBITURIC ACID/ DOSAGE (1)
BARBITURATES/ DOSAGE (2)
PHENOBARBITONE/ DOSAGE (2), EFFECT (1)
PRIMIDONE/ EFFECT (1), DOSAGE (1)
PHENYTOIN/ DOSAGE (1), THERAPY (1)
TROXIDONE/ EFFECT (1)
BECLAMIDE/ EFFECT (1)

E N D O F A R T I C L E

SMITH DL, KEASLING HH, FORIST AA
THE METABOLISM OF N-ALKYL-4-BROMOBENZENESULFONAMIDES IN THE MOUSE. CORRELATION WITH ANTICONVULSANT ACTIVITY.
J MED CHEM 8,520-4, JUL 65

NO. OF WORDS = 3014
(3) ANTICONVULSANTS

ANTICONVULSANTS/ ACTIVITY (3), EFFECT (2), ADMINISTRATION (1), THERAPY (1)

E N D O F A R T I C L E

SWINYARD EA, CASTELLION AW
ANTICONVULSANT PROPERTIES OF SOME BENZODIAZEPINES.
J PHARMACOL EXP THER 151,369-75, MAR 66

NO. OF WORDS = 3339
(3) ANTICONVULSANTS

127480 (3) TRIMETHADIONE, 3,5,5-TRIMETHYL-2,4-OXAZOLIDINEDIONE, OXAZOLIDINEDIONES

50066 (1) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENOBARBITAL, BARBITURATES

ANTICONVULSANTS/ PROPERTIES (1), ACTIVITY (2), EFFECT (2), EPILEPSY (1)
TRIMETHADIONE/ ADMINISTRATION (2), DOSAGE (1), ACTIVITY (1)
PHENOBARBITAL/ ACTIVITY (1)

E N D O F A R T I C L E

BUTLER TC, KUROIWA Y, WADDELL WJ
EFFECTS OF 5,5-DIMETHYL-2,4-OXAZOLIDINEDIONE (DMO) ON ACID-BASE AND ELECTROLYTE EQUILIBRIA.
J PHARMACOL EXP THER 152,62-6, APR 66

NO. OF WORDS = 2398
127480 (3) TRIMETHADIONE, 3,5,5-TRIMETHYL-2,4-OXAZOLIDINEDIONE, OXAZOLIDINEDIONES

TRIMETHADIONE/ ADMINISTRATION (1), EFFECT (1), ACTIVITY (1), DOSAGE (2), EPILEPSY (1), THERAPY (1)

E N D O F A R T I C L E

54

HUDGINS RL, CORBIN KB
AN UNCOMMON SEIZURE DISORDER, FAMILIAL PAROXYSMAL CHOREOATHETOSIS.
BRAIN 89,199-204, JUN 66

NO. OF WORDS = 2498
115388 (1) MEPHOBARBITAL, 5-ETHYL-1-METHYL-5-PHENYLBARBITURIC ACID, BARBITURATES

57410 (2) DIPHENYLHYDANTOIN, 5,5-DIPHENYL-2,4-IMIDAZOLIDINEDIONE, HYDANTOINS

(2) ANTICONVULSANTS

50066 (1) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENOBARBITAL, BARBITURATES

ANTICONVULSANTS/ THERAPY (2)
PHENOBARBITAL/ THERAPY (1)

E N D C F A R T I C L E

5. Output From Reduced Text

BERNSTEIN ZL
TREATMENT OF BARBITURATE COMA.
NEW YORK J MED 66, 2290-4, 1 SEP 66

NO. OF WORDS = 107
(3) BARBITURATES

BARBITURATES/ DOSAGE (3)

E N D O F A R T I C L E

NEALON TF JR, SUGERMAN H, SHEA W
AN EXTRACORPOREAL DEVICE TO TREAT BARBITURATE POISONING. USE OF ANION- EXCHANGE RESINS IN DOGS.
JAMA 197, 158-160, 11 JUL 66

NO. OF WORDS = 113
50066 (3) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENOBARBITAL, BARBITURATES

PHENOBARBITAL/ THERAPY (3), DOSAGE (3)

E N D O F A R T I C L E

LIPP JA
EPILEPSY. II. BASIC NEUROPHYSIOLOGICAL ASPECTS OF ANTICONVULSANT DRUGS.
APPL THER 8, 437-41, MAY 66

NO. OF WORDS = 164
(3) BARBITURATES

57410 (3) DIPHENYLHYDANTOIN, 5,5-DIPHENYL-2,4-IMIDAZOLIDINEDIONE, HYDANTOINS

63989 (3) PHENACEMIDE, PHENYLACETYLUREA

(3) ANTICONVULSANTS

BARBITURATES/ ACTIVITY (3)
DIPHENYLHYDANTOIN/ ACTIVITY (3)
ANTICONVULSANTS/ ACTIVITY (3)

E N D O F A R T I C L E

KLEIN JP
DIPHENYLHYDANTOIN INTOXICATION ASSOCIATED WITH HYPERGLYCEMIA.
J PEDIAT 69,463-5, SEP 66

NO. OF WORDS = 41
57410 (3) DIPHENYLHYDANTOIN, 5,5-DIPHENYL-2,4-IMIDAZOLIDINEDIONE, HYDANTOINS

DIPHENYLHYDANTOIN/ ADMINISTRATION (3)

E N D O F A R T I C L E

BUCHANAN DS
AN APPROACH TO MANAGEMENT OF STATUS EPILEPTICUS.
SOUTHWEST MED 47,187-9, JUL 66

NO. OF WORDS = 60
50066 (3) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENOBARBITAL, BARBITURATES

PHENOBARBITAL/ THERAPY (3)

E N D O F A R T I C L E

ARMBRECHT EC, STEERE DW
A CASE REPORT OF EVALUATION AND MANAGEMENT OF HYPERPLASTIC GINGIVA IN EPILEPTICS CAUSED BY SODIUM DILANTIN THERAPY.
W VIRGINIA DENT J 40,43-4, JUL 66

NO. OF WORDS = 115
57410 (3) DIPHENYLHYDANTOIN, 5,5-DIPHENYL-2,4-IMIDAZOLIDINEDIONE, HYDANTOINS, DILANTIN

630933 (3) DIPHENYLHYDANTOIN SODIUM, SODIUM 5,5-DIPHENYL HYDANTOINATE, HYDANTOINS, DILANTIN SODIUM

DILANTIN/ THERAPY (3)

E N D O F A R T I C L E

DOUGLAS A, SIMPSON D, MERCHANT S
THE EFFECT OF ANTISPASMODIC DRUGS ON THE ENDOMURAL BRONCHIAL (OR SQUEEZE) PRESSURES IN BRONCHITIS AND ASTHMA.
AMER REV RESP DIS 93,703-15, MAY 66

NO. OF WORDS = 85
(3) ANTISPASMODIC

ANTISPASMODIC/ ADMINISTRATION (3)

END OF ARTICLE

GILBERT JC, ORTIZ WR, MILLICHAP JG
THE EFFECTS OF ANTICONVULSANT DRUGS ON THE PERMEABILITY OF BRAIN CELLS TO D-XYLOSE.
J NEUROCHEM 13,247-55, APR 66

NO. OF WORDS = 149
50066 (3) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENOBARBITAL, BARBITURATES

695534 (3) DIMETHADIONE, 5,5-DIMETHYLOXAZOLIDINE-2,4-DIONE, OXAZOLIDINEDIONES

57410 (3) DIPHENYLHYDANTOIN, 5,5-DIPHENYL-2,4-IMIDAZOLIDINEDIONE, HYDANTOINS

(3) ANTICONVULSANTS

DIPHENYLHYDANTOIN/ EFFECT (3)
ANTICONVULSANTS/ EFFECT (3)

END OF ARTICLE

CHINITZ A, SEELINGER DF, GREENHOUSE AH
ANTICONVULSANT THERAPY IN TRIGEMINAL NEURALGIA.
AMER J MED SCI 252,62-7, JUL 66

NO. OF WORDS = 101
630933 (3) DIPHENYLHYDANTOIN SODIUM, SODIUM 5,5-DIPHENYL HYDANTOINATE, HYDANTOINS

57410 (3) DIPHENYLHYDANTOIN, 5,5-DIPHENYL-2,4-IMIDAZOLIDINEDIONE, HYDANTOINS, DILANTIN

(3) ANTICONVULSANTS

298464 (3) CARBAMAZEPINE, TEGRETOL

TEGRETOL/ EFFECT (3)
DIPHENYLHYDANTOIN SODIUM/ THERAPY (3)
CARBAMAZEPINE/ THERAPY (3)

E N D O F A R T I C L E

COLLINS VJ
ADVANCES IN PHARMACOLOGY RELATED TO ANESTHESIA AND SURGERY.
INDUSTR MED SURG 35,465-71, JUN 66

NO. OF WORDS = 117

E N D O F A R T I C L E

COOPER P
CRUGS FOR CCNVULSIVE DISORDERS.
MICWIFE HEALTH VISIT 2,212-3, MAY 66

NO. OF WORDS = 122
(3) ANTICCNVULSANTS

50066 (3) 5-ETHYL-5-PHENYLBARBITURIC ACID, PHENOBARBITAL, BARBITURATES

115388 (3) MEPHOBARBITAL, 5-ETHYL-1-METHYL-5-PHENYLBARBITURIC ACID, BARBITURATES, PROMINAL

76948 (3) 5-METHYL-5-PHENYLBARBITURIC ACID, BARBITURATES, RUTONAL

125337 (3) PRIMIDCNE, 5-PHENYL-5-ETHYLHEXAHYDROPYRIMICINE-4,6-DICNE, BARBITURATES, MYSCLINE

630933 (3) DIPHENYLHYDANTOIN SODIUM, SOCIUM 5,5-DIPHENYL HYDANTOINATE, HYCANTOINS, EPANUTIN

50124 (3) MEPHENYTCIN, 5-ETHYL-3-METHYL-5-PHENYLHYCANTOIN, HYDANTOINS, METHCIN, MESCNTCIN

MX-8028679 (3) HYCANTOINS, BARBITURATES, HYDANTAL

127480 (3) TRIMETHADICNE, 3,5,5-TRIMETHYL-2,4-OXAZOLICINEDICNE, OXAZOLICINEDICNES, TROXICCNE, TRICICNE

77678 (3) ETHOSUXIMIDE, 2-ETHYL,2-METHYLSUCCINIMIDE, SUCCINIMIDES

86340 (3) PHENSUXIMIDE, N-METHYL-2-PHENYLSUCCINIMIDE, SUCCINIMIDES, MILONTIN

77418 (3) CELCNTIN, N,2-DIMETHYL-2-PHENYLSUCCINIMICE, SUCCINIMIDES, METHSUXIMICE

501688 (3) N-BENZYL-BETA-CHLORCPROPICNAMIDE, CHLORCETHYLPHENAMIDE, BECLAMICE, NYDRANE

61563 (3) TETRAHYCRO-2-P-SULFAMOYL-PHENYL-1,2-THIAZINE-1,1-DIOXIDE, SULTHIAME, OSPOLCT

90493 (3) (2-PHENYLBUTYRYL)UREA, PHENETURIDE

298464 (3) CARBAMAZEPINE, TEGRETCL

RUTCNAL/ CCSAGE (3)
ANTICCNVULSANTS/ EFFECT (3)
PHENYTCIN SCDIUM/ THERAPY (3)

E N D C F A R T I C L E

SMITH CL, KEASLING HH, FORIST AA
THE METABOLISM OF N-ALKYL-4-BROMOBENZENESULFONAMIDES IN THE MOUSE.
CORRELATION WITH ANTICONVULSANT ACTIVITY.
J MED CHEM 8,520-4, JUL 65

NO. OF WORDS = 132
(3) ANTICONVULSANTS

ANTICONVULSANTS/ ACTIVITY (3)

E N D O F A R T I C L E

SWINYARD EA, CASTELLION AW
ANTICONVULSANT PROPERTIES OF SOME BENZODIAZEPINES.
J PHARMACOL EXP THER 151,369-75, MAR 66

NO. OF WORDS = 396
(3) ANTICONVULSANTS

127480 (3) TRIMETHADIONE, 3,5,5-TRIMETHYL-2,4-OXAZOLIDINEDIONE,
OXAZOLIDINEDIONES

TRIMETHADIONE/ ADMINISTRATION (3)
ANTICONVULSANTS/ ACTIVITY (2)

E N D O F A R T I C L E

BUTLER TC, KUROIWA Y, WADDELL WJ
EFFECTS OF 5,5-DIMETHYL-2,4-OXAZOLIDINEDIONE (DMO) ON ACID-BASE AND ELECTROLYTE EQUILIBRIA.
J PHARMACOL EXP THER 152,62-6, APR 66

NO. OF WORDS = 152
127480 (3) TRIMETHADIONE, 3,5,5-TRIMETHYL-2,4-OXAZOLIDINEDIONE, OXAZOLIDINEDIONES

TRIMETHADIONE/ ADMINISTRATION (3)

E N D O F A R T I C L E

HUGGINS RL, CORBIN KB
AN UNCOMMON SEIZURE DISORDER, FAMILIAL PAROXYSMAL CHOREOATHETOSIS.
BRAIN 89,199-204, JUN 66

NO. OF WORDS = 52
(3) ANTICONVULSANTS

ANTICONVULSANTS/ THERAPY (3)

E N D O F A R T I C L E

BIBLIOGRAPHY OF ARTICLES INCLUDED IN THE STATISTICAL EVALUATION

1. Bernstein, Z. L. Treatment of barbiturate coma. New York J. Med. 66, 2290-4, 1 Sept. '66.

2. Nealon, T. F., Jr., Sugerman, H., Shea, W. An extracorporeal device to treat barbiturate poisoning. Use of anion-exchange resins in dogs. JAMA 197, 158-160, 11 July '66.

3. Lipp, J. A. Epilepsy. II. Basic neurophysiological aspects of anticonvulsant drugs. Appl. Ther. 8, 437-41, May '66.

4. Klein, J. P. Diphenylhydantoin intoxication associated with hyperglycemia. J. Pediat. 69, 463-5, Sept. '66.

5. Buchanan, D. S. An approach to management of status epilepticus. Southwest Med. 47, 187-9, July '66.

6. Ambrecht, E. C., Steere, D. W. A case report of evaluation and management of hyperplastic gingiva in epileptics caused by sodium dilantin therapy. W. Virginia Dent. J. 40, 43-4, July '66.

7. Douglas, A., Simpson, D., Merchant, S. The effecy of antispasmodic drugs on the endomural bronchial (or squeeze) pressures in bronchitis and asthma. Amer. Rev. Resp. Dis. 93, 703-15, May '66.

8. Gilbert, J. C., Ortiz, W. R., Millichap, J. G. The effects of anticonvulsant drugs on the permeability of brain cells to D-xylose. J. Neurochem. 13, 247-55, Apr. '66.

9. Chinitz, A., Seelinger, D. F., Greenhouse, A. H. Anticonvulsant therapy in trigeminal neuralgia. Amer. J. Med. Sci. 252, 62-7, July '66.

10. Collins, V. J. Advances in pharmacology related to anesthesia and surgery. Industr. Med. Surg. 35, 465-71, June '66.

11. Cooper, P. Drugs for convulsive disorders. Midwife Health Visit 2, 212-3, May '66.

12. Smith, D. L., Keasling, H. H., Forist, A. A. The metabolism of N-alkyl-4-bromobenzenesulfonamides in the mouse. Correlation with anticonvulsant activity. J. Med. Chem. 8, 520-4, July '65.

13. Swinyard, E. A., Castellion, A. W. Anticonvulsant properties of benzodiazepines. J. Pharmacol. Exp. Ther. 151, 369-75, March '66.

14. Butler, T. C., Kuroiwa, Y., Waddell, W. J. Effects of 5, 5-dimethyl-2,4-oxazolidinedione (DMO) on acid-base and electrolyte equilibria. J. Pharmacol. Exp. Ther. 152, 62-6, Apr. '66.

15. Hudgins, R. L., Corbin, K. B. An uncommon seizure disorder, familial paroxysmal choreoathetosis. Brain 89, 199-204, June '66.